

# Work Order ID 61766

Thursday, September 02, 2010 11:18:48 AM



Page 1

Item ID: D350-748-101

Accept



Setup Start



Revision ID:

Stop



Item Name: Crosstube Installation, High Fwd

Start Date: 9/2/2010 Start Qty: 1.00



Cust Item ID:

Required Date: 9/20/2010 Req'd Qty: 1.00

Customer:

Reference:

Approvals:

Process Plan:

*M*

Date:

*10-9-02*

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

Draw Nbr	Revision Nbr
D350-748-141	Rev E

100

0.00



DOCUMENT CONTROL

DC

Memo

0.00

Document Control

Photocopy bluefile & type labels per PPPD350-748-101

CHG001

*Sulalis*

*10-02-10*

110

0.00



BENDING MACHINE - CROSSTUBES

CNC Bend 1

Memo

0.00

CNC Delta 100 Bender

Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT

*DP*

*10-11-23*

120

QC15- Crosstube Dimensional Check

0.00



QC

Memo

0.00

Quality Control

*Sulalis*

W/O: 61766		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
10.12.09	141	- DEFLECT TUBE TO 3500 <sup>16</sup> FOR 1 MINUTE - RE-MEASURE HEIGHT & WIDTH	CP	10.12.09	1	CP 10.12.09 QSI 642	CP 10.12.13	
10.12.09	142	NDT TUBE FOLLOWING DEFLECTION TEST				CP 10.12.09 QSI 642	CP 11.02.15	

Part No: D350-748-101 PAR #: \_\_\_\_\_ Fault Category: x-tubes NCR: Yes No DQA: \_\_\_\_\_ Date: 11.02.15  
 Resolution: rework Disposition: rework QA: N/C Closed: \_\_\_\_\_ Date: 11/02/15

NCR: 61766		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
10.11.23	<del>110</del> 110	Tube bent high. RC-process.	CP 10.11.23 QSI 042	REMOVE 1/8" FROM HIGHEST SIDE TO EVEN TUBE	CP 10-11-29 10/12/13	S 10/12/13	CP 10.11.23 QSI 042	S 10/12/14

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
125		0.00							
									
HandFXtube	Memo	0.00							
Hand Finishing Crosstubes	***Stress relief*** Heat treat crosstube as per QSI010 4.3 Temp: <u>375</u> <u>start time: 2400</u>			end 5:50 PM					
				SAP 10-11-24					
127	QC5- Inspect part completeness to step on W/O	0.00							
									
QC	Memo	0.00		8/16/24		70			
Quality Control									

end si SOP

SAP 10-11-24

8/24/24

70

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
130	Crosstubes	0.00				①			
Crosstubes	<b>Memo</b>	0.00							
Crosstubes	1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs, Set-up drill table as per QSI 010								
	2-Deburr								
	3-Engrave Part # and Batch # as per Dwg D350-748-141								
	4-Remove all marks from tube within limits of D350-748-141								
	5- Apply a light coat of LPS3 on the interior of tube Batch: _____								
140	QC5- Inspect part completeness to step on W/O	0.00							
QC	<b>Memo</b>	0.00							
Quality Control	CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)								

SAD  
10-11-29SAD  
10-11-30See  
Attached  
Email →P10  
on Frig.  
Box

outsourcing - NDT issue P10: to acuren P10: 13113

CZ 10/12/09 ①

Pack: ensure copy of <sup>NDT</sup> results rec'd  
attached to W/O:

W/O: 61766		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
10/12/09	175	NDT per QSI 038 before + after load test per eng. this time only P/D: 13113	CL	10/12/09	①	u 10-12-09		
		rec'd + inspect		14/12/10	②	u		

Part No: D350-748-101 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
150	Outsource process-Cadplate per QSI017 4.1.9.1	0.00							
	Outsource3	0.00							
	Outsource process - Cad plate								
	Memo								
	Issue P/O: 13128								
	Stress relief at 375° for 5 hours								
	Magnetic Particle Inspect per ASTM E1444								
	Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2								
	Embrittle relief at 375° for 8 hours, Chromate Treat								
	Possible Supplier: Southwest United Industries								
	Ensure Certificate of Conformity is attached								
160	Receive & Inspect for Damage & Mat'l Certs	0.00							
	Packaging	0.00							
	Packaging								
	Memo								
	Ensure certificate of conformity is attached								
170	QC5- Inspect part completeness to step on W/O	0.00							
	QC	0.00							
	Quality Control								

CZ 10/12/14 ①

10/1/18 ①

11/01/24 / 11.01.24

SPAR - 61.3125"  
twist = .023" issue R10 acumen hPI per ASTM 1417 Level 2 as per QSC038  
R10:13367 CZ 11/01/24 ①

rec'd + inspect + attached c/c to w/o

11/01/24

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180  SprayPaint	SprayPaint	0.00							
	<b>Memo</b>	0.00							
	1-Prime inside crosstube as per QSI 005 4.2 2-Prime Outside of Tube as per Dart QSI 005 4.2								
190  QC	QC14- Inspect Spray Paint	0.00							
	<b>Memo</b>	0.00							
	Then, Wrap in plastic bag to protect from scratches								
200  Crosstubes	Crosstubes	0.00							
	<b>Memo</b>	0.00							
	1-Install Ground wire Insert, then insert screw and washer								
	2-Install Abraison strips as per Dwg D350-748-141 & QSI 035.								
	3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS								

W/O:		WORK ORDER CHANGES					
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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

210

QC5- Inspect part completeness to step on W/O

0.00

8/11/02/08

0.00

(X)

QC

Memo

Quality Control

220

Pick Kit

0.00

0.00

11/2/02

Packaging

Memo

Packaging

230

QC4- 100% Inspect kits for completeness

0.00

0.00

8/11/02/16

(X)

QC

Memo

Quality Control

W/O:		WORK ORDER CHANGES					
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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240	Packaging	0.00							
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: 102								
	PPP Rev: B								
250	QC21- Final Inspection - Work Order Release	0.00							
QC	Memo	0.00							
Quality Control									

11/02/10  
11/02/14  
MF  
11-02-11

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

2. Once the problem is identified, the next step is to define the objectives and goals of the project. This helps to clarify what needs to be achieved and provides a clear direction for the team.

3. The third step is to develop a plan or strategy to address the problem. This involves breaking down the problem into smaller, manageable tasks and determining the resources needed to complete each task.





4. The fourth step is to implement the plan. This involves putting the strategy into action and monitoring progress regularly to ensure that the project is on track.

5. The final step is to evaluate the results of the project. This involves comparing the actual outcomes with the objectives and goals to determine the effectiveness of the project and identify areas for improvement.

\_\_\_\_\_

**Required Qty: 1.00**

**Comments:** IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-141TRN 		Manufactured	No			110	Each	0.0000	1				
Crosstube Turning Detail													
ALS4-1032-225 		Purchased	No			200	Each	5,336.000	1	1			
Insert													
				<u>Location</u>		<u>Loc Qty</u>		<u>Loc Code</u>					
				PK011		5336							
					110768	5336							
AN960JD10 	NAS1149D0363J	Purchased	No			200	Each	6.0000	1	1			
Washer													
				<u>Location</u>		<u>Loc Qty</u>		<u>Loc Code</u>					
				ST		6							
					107715	6							
D2856-400 		Manufactured	No			200	f	313.4060	1.181	1.243158			
Abraison Strip													
				<u>Location</u>		<u>Loc Qty</u>		<u>Loc Code</u>					
				ST403		313.4060421							
					56626	97.4060421							
					59920	216							

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Start Date: 9/2/2010

Required Date: 9/20/2010

Start Qty: 1.00

Required Qty: 1.00

D3502-1  
Support  
Manufactured No

200 Each 54.0000 2 2



11-02-04

Location	Loc Qty	Loc Code
ST063	12	
61206	12	
ST066	42	
50287	38	
52903	4	

MS21920-20  
Clamp (per MIL-DTL-8783C)  
Purchased No

200 Each 77.0000 2 2



11-02-04

Location	Loc Qty	Loc Code
LG	77	
112624	6	
114687	21	
114779	24	
115057	26	

MS27039-1-10  
Screw  
Purchased No

200 Each 126.0000 1 1



11-02-04

Location	Loc Qty	Loc Code
ST291	126	
112794	26	
112940	100	

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Start Qty: 1.00

Required Qty: 1.00

AN4-41A

Purchased

No

220

Each

274.0000

8

18



Bolt



1115378 11/2/10

Location

Loc Qty

Loc Code

ST337

40

ST360

234

111424

4

113359

30

114941

100

115108

100

AN4-6A

Purchased

No

220

Each

1,418.000

16

16



Bolt



1115698 11/2/10

Location

Loc Qty

Loc Code

ST356

1418

112933

96

113149

19

114523

2

114615

1

114941

500

115108

300

115457

500

AN5-32A

Purchased

No

220

Each

196.0000

4

4



Bolt



1115698 11/2/10

Location

Loc Qty

Loc Code

ST340

196

113121

4

114056

42

114405

50

115016

50

115108

50

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AN960JD416 NAS1149D0463J Purchased No

220

Each

0.0000

32 32

Washer

AN960JD516 NAS1149D0563J Purchased No

220

Each

34.0000

8 8

Washer

## Location

## Loc Qty

## Loc Code

ST

34

103694

18

107534

12

109287

4

D3500-1 Manufactured No

220

Each

30.0000

4 4

Saddle

## Location

## Loc Qty

## Loc Code

ST424

30

55605

2

59422

16

60489

12

D3501-1 Manufactured No

220

Each

394.0000

16 16

Bushing

## Location

## Loc Qty

## Loc Code

ST066

394

45402

15

45918

112

48268

67

53779

100

61196

100

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Start Qty: 1.00

Required Qty: 1.00

MS21042L4

Purchased

No

220

Each

2,379.000

24

24

23

1A

M116548

M115621

11/2/10

Nut

## Location

## Loc Qty

## Loc Code

ST300

2379

113422

68

114523

28

114718

16

114784

347

115108

1920

MS21042L5

Purchased

No

220

Each

633.0000

4

4

M115594

11/2/10

Nut

## Location

## Loc Qty

## Loc Code

ST139

133

114813

133

ST300

500

115156

500

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

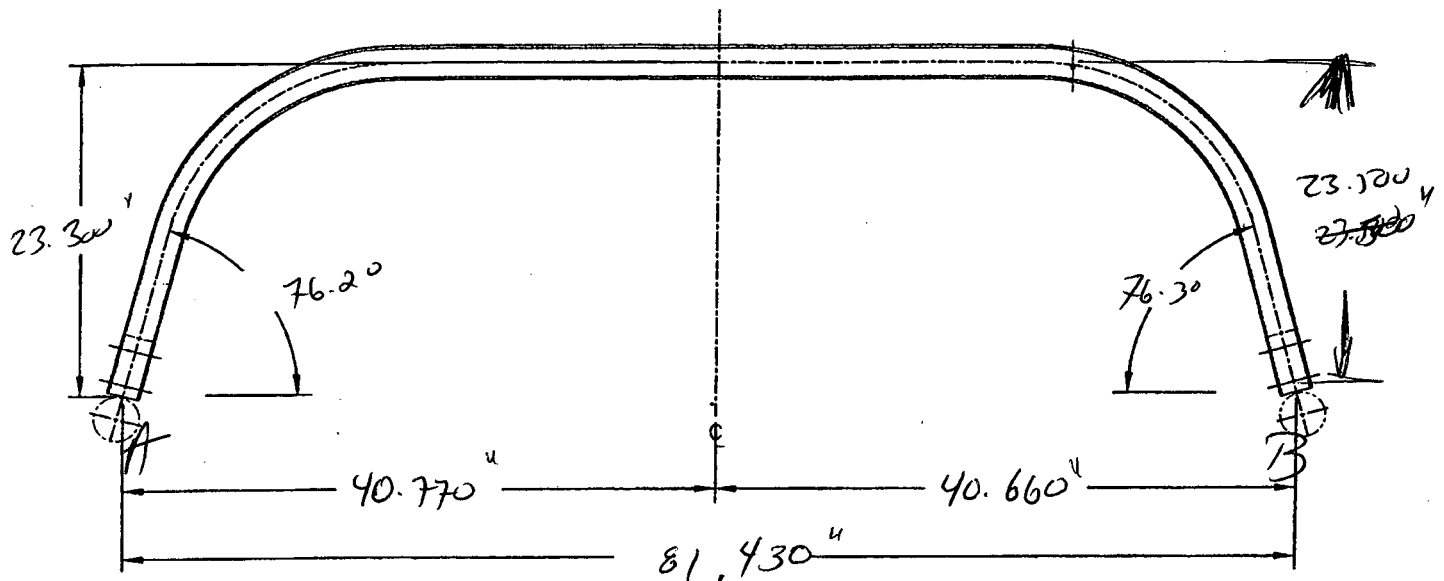
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



DART AEROSPACE LTD		Work Order:	61764
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
Twist = 0.042" OK 10/11/23
RMV 1/8" FROM 23.50" SIDE

QC15 Inspection	8
Date	10/14/23

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

10/08/23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

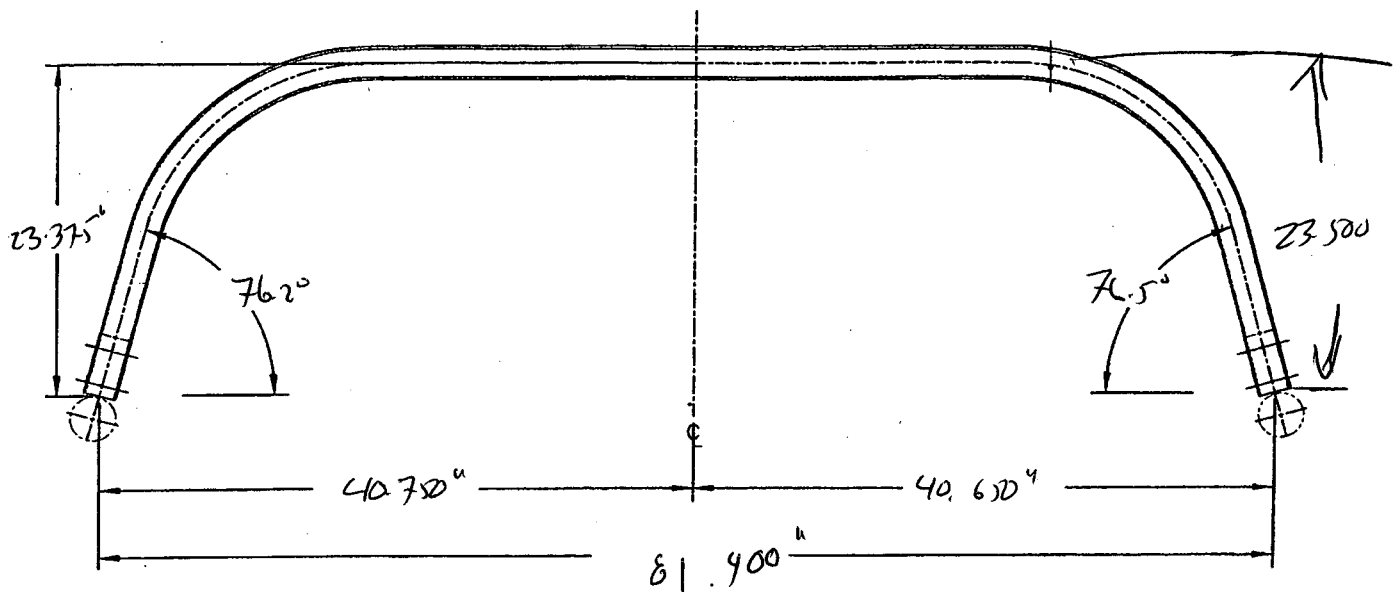
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141      Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
twist = 0.38"
Re measure after stress relief.

QC15 Inspection	8
Date	10/14/24

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

10/14/24

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6017-115	CROSSTUBE
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: SCRIBE DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

WORK ORDER  
NO. *61766*  
*BS-0-9-02*

**RELEASED**  
2009-10-29  
*JWP*

E	REVISE GENERAL NOTES: UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	<i>RF</i>	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>RF</i>	DRAWING NO.	REV. E
MFG. APPR.	<i>RF</i>	D350-748-141	SHEET 1 OF 4
APPROVED	<i>RF</i>	TITLE	SCALE
DE APPR.	<i>RF</i>	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	09.09.30	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

8 7 6 5 4 3 2 1

D

C

B

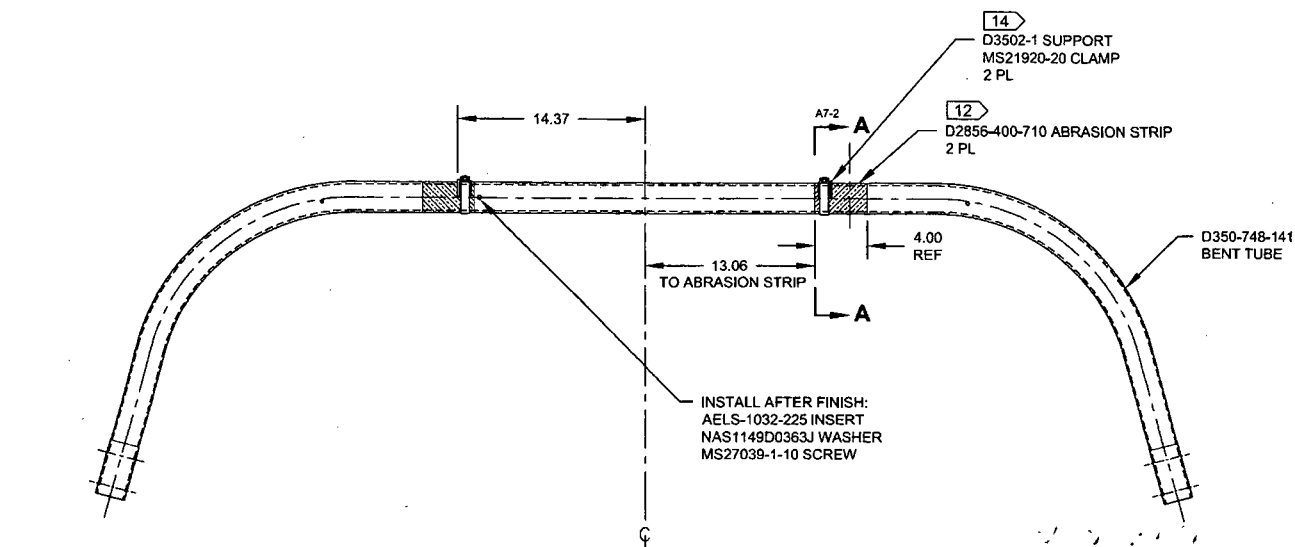
A

D

C

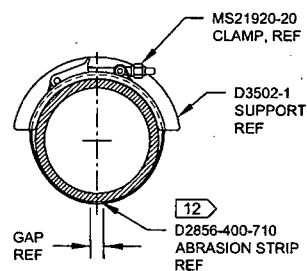
B

A



**D350-748-141  
ASSEMBLY DETAIL**

*wlo 61764*



**SECTION A-A D4-2  
SCALE 4X**

**RELEASED**  
2009-10-29

DESIGN	97	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	97	DRAWING NO.	REV. E
MFG. APPR.	97	D350-748-141	SHEET 2 OF 4
APPROVED	97	TITLE	SCALE
DE APPR.	97	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	09.09.30	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMBINATION OF PURPOSES WITHOUT THE WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

8 7 6 5 4 3 2 1

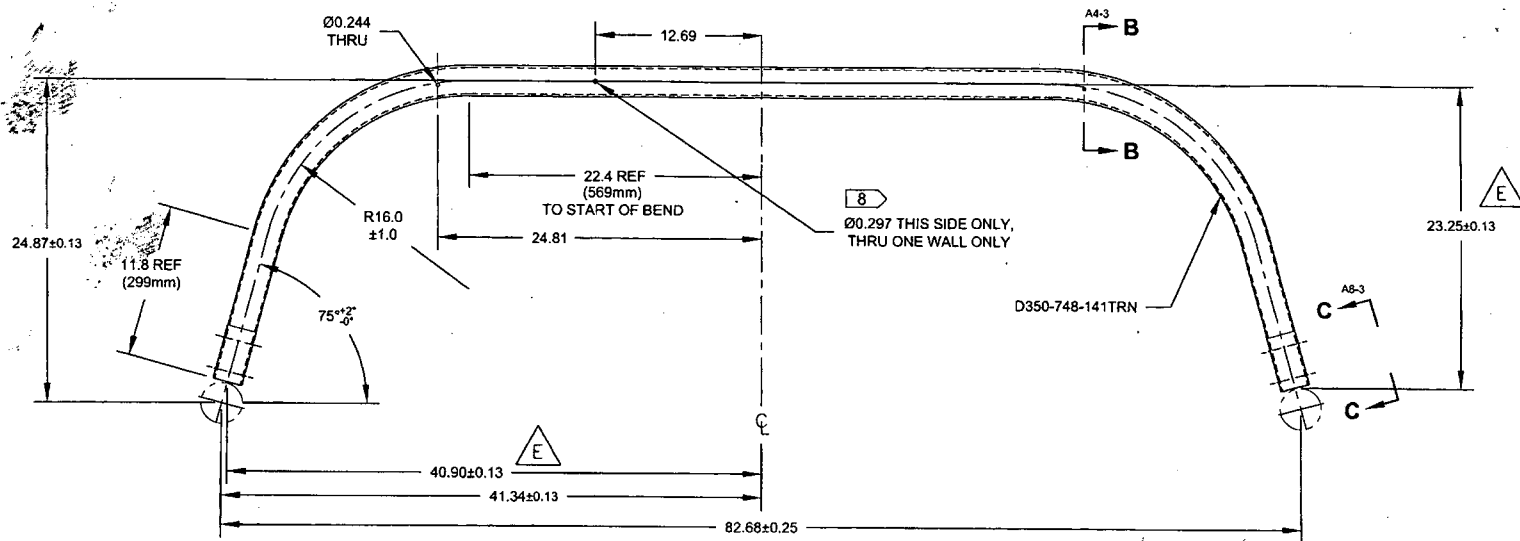
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

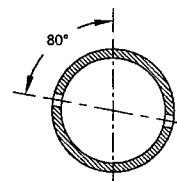
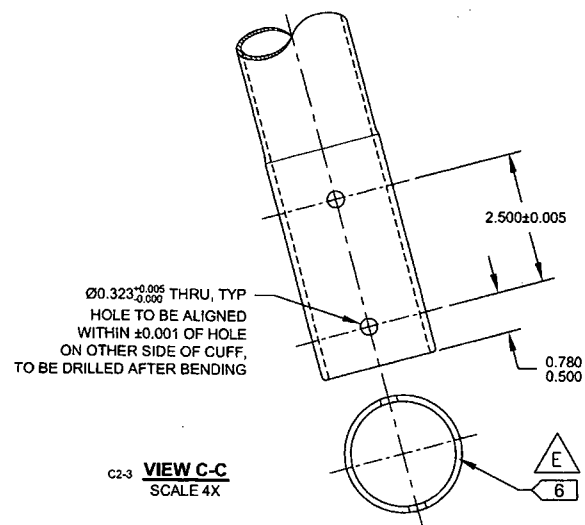
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10



**SECTION B-B** D3-3  
 SCALE 4X

*w/041764*

**RELEASED**  
 2009-10-29

DESIGN	9P	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	9P	DRAWING NO.	REV. E
MFG. APPR.	9P	D350-748-141	SHEET 3 OF 4
APPROVED	9P	TITLE	SCALE
DE APPR.	9P	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	09.09.30	COPYRIGHT © 2006 BY DART AEROSPACE LTD	
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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**L Lacelle**

**From:** David Shepherd [dshepherd@dartaero.com]  
**Sent:** May 11, 2010 12:37 PM  
**To:** 'L Lacelle'; 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com; 'Chantal Lavoie'  
**Subject:** RE: 350 crosstubes

Linda,

As discussed, if the tubes have been structurally tested, it has been documented on the work orders, and Chris has signed off on them, then it is acceptable to me to release the parts.

David

---

**From:** L Lacelle [mailto:llacelle@dartaero.com]  
**Sent:** Tuesday, May 11, 2010 8:37 AM  
**To:** 'David Shepherd'; 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com; 'Chantal Lavoie'  
**Subject:** RE: 350 crosstubes

Now that testing is done, can we ship out the batch that as been ready to heat treat?

LL

---

**From:** David Shepherd [mailto:dshepherd@dartaero.com]  
**Sent:** April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

*I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.*

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

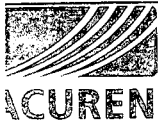
David.

No virus found in this incoming message.

Checked by AVG - [www.avg.com](http://www.avg.com)

Version: 8.5.437 / Virus Database: 271.1.1/2865 - Release Date: 05/11/10 06:26:00

12/06/10



## LIQUID PENETRANT TEST REPORT

P- 05492

PAGE 1 OF 1

CLIENT ART AEROSPACE DATE Dec 9/2010 TIME AM ☒ PM ☐  
ATTENTION ANDY KACELLE / MANUFACTURING ACUREN JOB NO. 183-10-C987  
ADDRESS 1270, HILBE RD NW POW/NO. AS ADDRESS  
HALVICKS BUILT, ON WORK LOCATION AS ADDRESS  
ACCEPTANCE STD. ASIM 1417/CS 1038 REV./DATE 2008  
PROJECT Liquid Penetrant Inspection on "CRSSTUBE" - HIGH AFT  
ITEM(S) EXAMINED SEE W.O. # IN RESULTS

JOB DESCRIPTION PERFORMED A WET FLO INSPECTION BY LIQUID PENETRANT ON 100% OF THE EXTERNAL SURFACE  
PROCEDURE NO. LT-003 REV./DATE 2008 TECHNIQUE NO. LT-003 REV./DATE 2008  
PART NO. 4730 MATERIAL N/A THICKNESS N/A  
SCOPE PERFORMED A WET FLO INSPECTION BY LIQUID PENETRANT ON 100% OF THE EXTERNAL SURFACE

TEST DETAILS  
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
FAMILY BRAND MACALFLEX BLACK LIGHT S/N 13790 ☒ OUTPUT > 1000 ft W/CM<sup>2</sup> ☐ AMBIENT < 2 fc  
PENETRANT ZK-67 MINIMUM DWELL TIME 10 MIN. LIGHTING EQUIP. ☒ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
PENETRANT REMOVER H<sub>2</sub>O MINIMUM DRY TIME >10 MIN. OTHER  
DEVELOPER SKD-32 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N CAL DUE DATE FEB 15 2011  
DEVELOPER TYPE ☐ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/ 50°F ☒ 10°C/ 50°F TO 52°C/ 125°F ☐ > 52°C/ 125°F

RESULTS- ☐ METRIC ☒ IMPERIAL

#	ITEMS	CRSSTUBE - W.O. ID	63746	63747	63748	63749	61763	61764	61765	61766
1	2	3	4	5	6	7	8			
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
B	A	SEE NOTE	BA							
ITEMS			ACC. 201							
5X MOUNTS		W.O. ID 61890	✓							

NOTE: B = BEFORE DEFLATION TEST  
A = AFTER DEFLATION TEST

ITEM ID: D350-748-201 (Items #1, 2, 3, 4)

ITEM ID: D350-748-101 (Items #5, 6, 7, 8)

ITEM ID: D3687-3 (MOUNTS)

Scope of Services  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care  
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

## SIGNATURES

CLIENT REPRESENTATIVE John Taley DTR # EC3104  
TECHNICIAN (SIGNATURE): [Signature] REPORT REVIEWED BY: [Signature]  
NAME (PRINT): VES DESK S. KR NAME INITIALS  
1<sup>ST</sup> TECHNICIAN 2<sup>ND</sup> TECHNICIAN  
CGSB LEVEL 3 SNT LEVEL 2 CGSB LEVEL --- SNT LEVEL ---  
CGSB REG. NO. 3044 CGSB REG. NO. ---

WHITE - CLIENT COPY

CANARY - OFFICE COPY

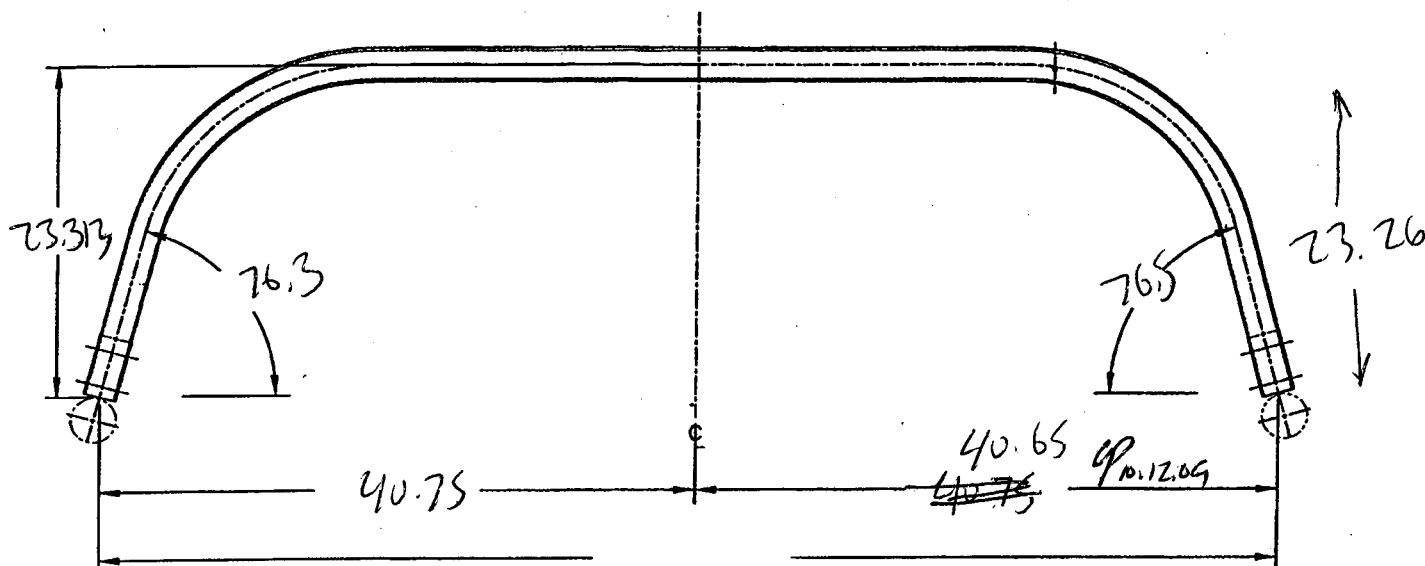
PINK - TECHNICIAN COPY

GOLD - OFFICE COPY

PT Sept 2005

DART AEROSPACE LTD		Work Order:	61766
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
DEFECT FOLLOWING DEFLECTION TEST
ACCEPTABLE P 10.12.09

QC15 Inspection	P
Date	10.12.09

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

10.08.23

**CERTIFICATE OF  
CONFORMANCE**

**CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1**

**DATE:** Jan-14-2011

**CONIGNED TO:** Dart Aerospace Ltd.  
1270 Aberdeen St  
Hawksbury, ON K6A 1K7

**W/O #:** 100754

**INVOICE #:** 52907

**CONTRACT OR  
PURCHASE ORDER #**

**PO13128**

**DESCRIPTION:** SKID

**QTY** 1

**P/N #** d350-748-101

**S/N #** B61766

**STRESS RELIEF BAKE @375 DEG. BAKE HEAT CHART #10-1335.  
MPI INSPECTED IAW ASTM-E-1444. CADMIUM PLATED IAW AMS-  
QQ-P-416C, TYPE 2 YELLOW, CLASS 1. BAKE HEAT CHART #11-5.**

*Sulley*

**CERTIFICATE: I certify that the items indicated here on have  
been inspected and tested and conform to all specifications  
and requirements detailed on the contract or purchase order.**

**Approved Inspector:**





## LIQUID PENETRANT TEST REPORT

P- 05496

PAGE 1 OF 2

CLIENT DART AEROSPACE DATE JAN/26/2011 TIME AM ☒ PM ☐  
ATTENTION LINDA LACELLE CHANTAKE/IAN ACUREN JOB NO. 188-11-  
ADDRESS 1270, A BELDEN ST. PO/VO NO. AS ADDRESS  
HAWKESBURY, ON WORK LOCATION AS ADDRESS  
ACCEPTANCE STD. ASTM1417/BSI-038 REV./DATE 2005  
PROJECT WET FLUO PENETRANT INSPECTION ON 14 "CROSS TUBES"; 4 "COLLECTIVE BEEL CRACK"  
ITEM(S) EXAMINED SEE BELOW

JOB DESCRIPTION PROCEDURE NO. LT-002 REV./DATE 2008 TECHNIQUE NO. LT-002 REV./DATE 2008  
PART NO. MATERIAL ALODINE ALUMINUM THICKNESS N/A  
SCOPE PERFORMED A WET FLUORESCENT LIQUID PENETRANT INSPECTION ON 100% OF THE EXTERNAL SURFACE

TEST DETAILS  
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
FAMILY BRAND MAGNA FLUX BLACK LIGHT S/N 13798 OUTPUT > 1000  $\mu$ W/CM<sup>2</sup> ☒ AMBIENT < 2 fc  
PENETRANT Z6-67 MINIMUM DWELL TIME 10 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
PENETRANT REMOVER H<sub>2</sub>O MINIMUM DRY TIME > 10 MIN. OTHER  
DEVELOPER SKD-52 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N CAL DUE DATE FEB/25/2011  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < - 4°C/ 20°F ☐ - 4°C/ 20°F TO 10°C/ 50°F ☒ 10°C/ 50°F TO 52°C/ 125°F ☐ > 52°C/ 125°F

RESULTS- ☐ METRIC ☒ IMPERIAL

NO.	COMMENTS	ACCEPT	REJECT
1	4 X "COLLECTIVE BEEL CRACK"	✓	
2	CROSS-TUBE W.O. ID 63591	✓	
3	CROSS-TUBE W.O. ID 63592	✓	
4	CROSS-TUBE W.O. ID 63746	✓	
5	CROSS-TUBE W.O. ID 63747	✓	
6	CROSS-TUBE W.O. ID 63748	✓	
7	CROSS-TUBE W.O. ID 63749	✓	

SEE Page 2 of 2

NOID 64913 → ITEM ID: - D350-748-1-007  
ITEM ID: - D350-748-101 (H. F.)  
ITEM ID: - D350-748-101 (H. F.)  
ITEM ID: - D350-748-201 (H. A.)  
ITEM ID: - D350-748-201 (H. A.)  
ITEM ID: - D350-748-201 (H. A.)  
ITEM ID: - D350-748-201 (H. A.)  
ITEM ID: - D350-748-201 (H. A.)

## Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

## Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

## SIGNATURES

CLIENT REPRESENTATIVE Jan T. Hley SIGNATURE [Signature] DTR # E63121  
TECHNICIAN (SIGNATURE): [Signature] REPORT REVIEWED BY: [Signature]  
NAME (PRINT): YVES DESROSIERS NAME INITIALS  
1<sup>ST</sup> TECHNICIAN CGSB LEVEL 2 SNT LEVEL 2 2<sup>ND</sup> TECHNICIAN CGSB LEVEL 2 SNT LEVEL 2  
CGSB REG. NO. 3049 CGSB REG. NO. 3049





RAPPORT#

## RAPPORT D'INSPECTION NON DESTRUCTIVE

(SUITE)

REPORT# P-05496

PAGE 2 DE 2

CLIENT

DART AEROSPACE

DATE

JAN/26/2011

HEURE ☒ AM ☐ PM

ATTENTION

LEDA LACELLE / CHANTAGE / IAN

ACUREN W/O :

188-11-02103

## RÉSULTATS

☐ MÉTRIQUE ☒ IMPÉRIALE

ITEM	COMMENTS	ACCEPT	REJECT	ITEM ID
8	CROSS TUBE W.O. ID 61763	✓		ITEM ID D350-748-101(H.F.)
9	CROSS TUBE W.O. ID 61764	✓		D350-748-101(H.F.)
10	CROSS TUBE W.O. ID 61765	✓		D350-748-101(H.F.)
11	CROSS TUBE W.O. ID 61766	X		D350-748-101(H.F.)
12	CROSS TUBE W.O. ID 61767	✓		D350-748-201(H.A.)
13	CROSS TUBE W.O. ID 61768	✓		D350-748-201(H.A.)
14	CROSS TUBE W.O. ID 61769	✓		D350-748-201(H.A.)
15	CROSS TUBE W.O. ID 61770	✓		D350-748-201(H.A.)

— NO REJECTABLE INDICATION WAS DETECTED, AS PER APPLICABLE STANDARD

## Étendue des services

L'entente selon laquelle le Groupe Acuren Inc. Exécute les services ne concerne que les énoncés par écrit. En aucune circonstance ces services ne s'étendent au-delà de l'exécution des services demandés. Il est entendu que toutes les descriptions, les observations et les expressions d'opinions faites par Acuren reflètent les opinions ou les observations de l'entreprise fondées sur l'information et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent pas des déclarations ou des garanties ou ne peuvent être interprétées comme constituant. Le groupe Acuren Inc. N'assume aucune des responsabilités du propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité entière des décisions prises en matière d'ingénierie, de fabrication, de réparation et d'usage à partir de l'information ou des données fournies par Acuren en rapport avec les services décrits dans les présentes ne peuvent excéder le coût des services rendus.

## Norme de Diligence

Dans l'exécution des services, le Groupe Acuren Inc. Applique le degré de diligence, le soin et la compétence normalement exercés dans des circonstances semblables par d'autres fournisseurs de ce type de services opérant dans la même localité ou dans une localité similaire. Aucune autre garantie, implicite ou explicite, n'est faite ou voulue par le Groupe Acuren Inc.

## SIGNATURES

REPRÉSENTANT CLIENT

TECHNICIEN (SIGNATURE):

NOM (MOULIÉ):

Bar T. Hey  
MOULÉ  
J. VESDESISIEK  
1<sup>er</sup> TECHNICIEN

Signature  
2<sup>nd</sup> TECHNICIEN

ONGC NIVEAU 2 SNT NIVEAU 2  
ONGC N° REGISTRATION 3049

ONGC NIVEAU SNT NIVEAU  
ONGC N° REGISTRATION

FTJ#: E63121

RAPPORT

RÉVISÉ PAR:

NOM

INITIALES

**REFERENCE ONLY****5.0 PARTS LIST**

Qty -101	Qty -201	Part Number	Description
X		D350-748-101	CROSSTUBE INSTALLATION, AS 350/355 HIGH FWD
	X	D350-748-201	CROSSTUBE INSTALLATION, AS 350/355 HIGH AFT
1		D350-748-141	CROSSTUBE ASSEMBLY, AS 350/355 HIGH FWD
	1	D350-748-241	CROSSTUBE ASSEMBLY, AS 350/355 HIGH AFT
*2	*2	D3502-1	SUPPORT
*2	*2	D2856-400-710	ABRASION STRIP
*1	*1	AELS-1032-225	INSERT
*2	*2	MS21920-20	CLAMP
*1	*1	MS27039-1-10	SCREW
*1	*1	AN960JD10	WASHER
4	4	D3500-1	SADDLE
16	16	D3501-1	BUSHING
16	16	AN4-6A	BOLT
8	8	AN4-41A	BOLT
4	4	AN5-32A	BOLT
32	32	AN960JD416	WASHER
8	8	AN960JD516	WASHER
24	24	MS21042L4	NUT (OR MS21042-4)
4	4	MS21042L5	NUT (OR MS21042-5)

\* REFERENCE ONLY. PARTS ARE INCLUDED IN D350-748-141/241 ASSEMBLIES ABOVE

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Revision: **B**

Date: 07.06.15